

Pre-Show

MOTION & MACHINES

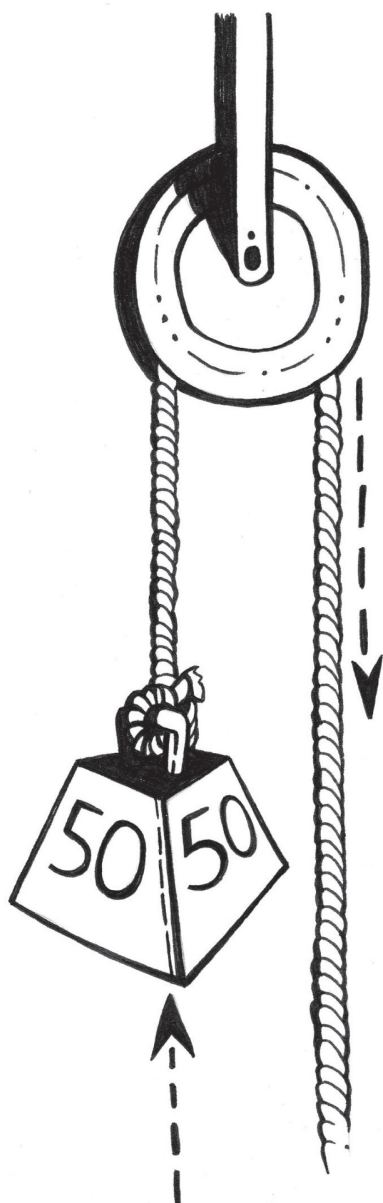
ABOUT THE SHOW

How many machines do you use in a day? One or two, maybe, or dozens?

A machine is anything that helps us move things. Suppose you have to change a flat tire. You use a wrench to loosen the lug nuts, a jack to lift the car, and your arms to actually remove the tire. These are all examples of machines. We use machines to overcome the forces of friction and gravity. Friction is the force that makes it hard to slide things. Gravity is the force that pulls things towards the center of the Earth, giving them weight.

The Motion and Machines show demonstrates how we use simple machines such as the lever, wheel, pulley, and inclined plane to overcome these forces and get things to move. Students are delighted to learn that things like scissors, seesaws, and even arms are actually simple machines! They also learn that Newton's laws explain the motions we see and do everyday.

The following activities are designed to help your students preview some ideas about motion and machines. They will also help your students have fun with science! Please remember to use appropriate safety rules for all activities. Adults should always supervise students during experiments.



**Thank you for scheduling a Franklin Institute
Traveling Science Show.
We are excited to visit you soon!**

WHAT'S THE RUB?

FOR GRADES 1-5

Have you ever wondered what keeps you from sliding all over the place, or what makes some things slippery? Friction is the force that occurs when things rub together. Some materials, such as sandpaper and carpet, have large bumps on their surface that make it hard for things to slide over. In other words, they create a lot of friction. Other materials have much smaller bumps, causing less friction. In this activity, students will experience the force of friction, and compare the friction generated by different materials. Our show will then demonstrate how we use simple machines to overcome the force of friction.

EQUIPMENT

*Hockey puck
(or something of
similar shape)*

Carpet

Wood

Tablecloth

Sandpaper

Wax paper

*Any other material
you want to test*

PROCEDURE

1. Slide the hockey puck over each of the materials.
2. It is difficult to slide the hockey puck over certain materials.

Which ones? What does it feel like when you try to slide the puck over these materials?

3. Sort out the materials that make it easy for the hockey puck to slide across.
Why do you think it is easier to slide something over those materials?



ROLLING, ROLLING, ROLLING

FOR GRADES 1-3

We use wheels to make cars, skateboards, and bikes move smoothly. Because of their rolling motion, wheels reduce friction and enable things to move easily. In this activity, students explore round objects and rolling motion. After conducting their own experiments, students have a chance to invent their own rolling machine! These experiments give students experience with the effects of Newton's laws, a major theme of our show.

EQUIPMENT

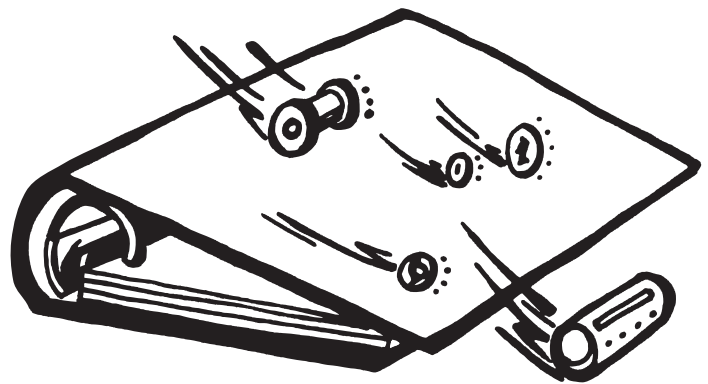
Assorted round objects, such as: spool, paper tube, marble, paper cup, jar lid, coin

Assorted materials, such as: felt, cloth, sandpaper, foil, wax paper, bubble wrap

*Ramp
(a board and blocks, or a thick 3-ring binder)*

Rulers

Stop-watches



PROCEDURE

1. Brainstorm, "What is round? What are some round objects in our school or home?"
Note that some things are round in one direction (such as a jar lid), while others are spherical (such as a ball).
2. Divide into small groups (3-6 people). Each group will need a ramp, a variety of round objects, some material samples, a ruler, and a stop-watch.
3. Experiment by rolling objects down the ramp. Use the ruler to see which rolls farthest, or the stop-watches to see which rolls fastest. Which objects roll best?
4. Cover the ramp with one of the materials, and repeat your experiment. Did the object roll as fast and as far? Try another material. How does the motion change? Can you use a material to make something stop rolling? Or to make something roll faster?
5. Try to invent something that rolls up a ramp, or that can carry a coin as it rolls.
You may want additional materials for inventing, such as rubber bands, string, or tape.

PLAYGROUND SCIENCE

FOR GRADES 4-6

Did you know that your playground has many machines in it? In this activity, students will find common examples of simple machines and explore how they make work easier. During the show, we will demonstrate more examples of simple machines that help us do work.

EQUIPMENT

Seesaw

Slide

A cloth bag filled with something heavy

A long rope

PROCEDURE

1. Try to lift one of your friends straight up into the air. Is it easy? Then have your friend sit near the middle of the seesaw, and push down on one end. Can you lift your friend now? What if your friend moves to the end of the seesaw?
2. Tie the rope to the handles of the bag. Climb to the top of the slide. Have someone hand you one end of the rope. Can you pull the bag straight up to the top? Hang onto your end of the rope, but have a friend move the bag to the end of the slide. Now try to pull the bag up the slide. Is this easier than lifting it straight up?
3. Try to find examples of these simple machines: wheel and axle, pulley, screw. How many different examples can you find in your school?

